THE DECIDUOUS MAGNOLIAS OF WEST FLORIDA

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The deciduous magnolias are perhaps the most distinctive relicts of the old Arcto-Tertiary forest. Pleistocene glaciation apparently eliminated these once-widespread plants everywhere from the temperate zone except in the eastern United States and in an arc stretching from Sikkim and Nepal to the Japanese Islands. Abundant rainfall, moderate temperatures, and rich mixed hardwoods seem essential for their greatest development in such regions as the southern Appalachians and the Cumberlands in this country. There *Magnolia acuminata* and *M. fraseri* contribute a minor though noteworthy element to the mixed mesophytic forests, growing alongside tuliptrees, hemlocks, lindens, buckeyes, and other characteristic species. In the lower valleys, especially along watercourses, *M. tripetala* and (in the Cumberlands) *M. macrophylla* display their huge leaves. Even the casual observer soon learns to associate the deciduous magnolias with our mountain forests in their cool, well-watered lushness. It may come then as a surprise to discover that each of these four eastern deciduous magnolias, either in itself or in a closely related species, can be found amid the predominantly piney woodlands of the Florida Panhandle.

This is not to suggest that these species can be found on the Coastal Plain only in West Florida, but that their remarkable collocation and the mode of their survival there in a presumably alien environment are of special taxonomic and ecological interest. This region differs from the rest of the lower Coastal Plain stretching from Virginia to eastern Texas mainly in its deeply incised terrain. The pine-covered uplands and the evergreen bays characterizing this zone are interrupted here and there by bluffs, steep-sided watercourses, and sharply rolling country, all of which provide

a foothold for a strongly deciduous and often surprisingly Appalachian plant assembly.[1] On these slopes, especially where the soil is rich and water-retentive, more northern genera such as *Fagus*, *Halesia*, *Oxydendrum*, and *Tilia* mix with such subtropical species as *Magnolia grandiflora* and *Quercus laurifolia*;[2] some of the riverbluffs supported American chestnut until quite recently (Elias, 1971).[3] The understory will often prove to be a thick tangle of the Appalachian *Kalmia latifolia* and the coastal bay-plant *Illicium floridanum*. In the calcareous regions, where the deciduous component is most prevalent, herbaceous plants such as *Trillium* and *Sanguinaria* put in an appearance. Throughout West Florida the indicator plant for such mesic sites is the silky camellia, *Stewartia malacodendron*.[4]

These anomalous patches of forest suggest a time, undoubtedly during a glacial epoch, when a deciduous forest covered much more of the area. Phytogeographers have long noted the more northerly elements in the ravine flora

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[1]See Thorne (1949) for a discussion of Appalachian species in the ravines of Southwest Georgia. E. L. Braun (1950) mentions the presence of a more deciduous element in the incised Tunica Hills section of eastern Louisiana.

[2]There seems to be some confusion about the proper nomenclature for the common "laurel oak" of the coastal zone. Kurz and Godfrey (1962) argue that this plant should be called *Q. hemisphaerica* Bartram. In this paper I have chosen to follow the conventional ascription of Preston (1961).

[3]Old-timers in Okaloosa and northern Escambia Counties recall the chestnut tree quite well. Unfortunately, the crowns do not seem to sprout as well as they do further north, and the frequency of chinkapins in the area keeps the blight pathogen in plentiful supply.

[4]Walter's pine (*Pinus glabra*) is also always present in these deciduous forests, but it is not a good indicator since it is also an element of what may be called the hammock association, a mixture dominated by this pine, *Magnolia grandiflora*, and the evergreen oaks *Quercus virginiana* and *Quercus laurifolia*. This climax association will eventually take over dry pine flats and ridges if the leaf litter is allowed to build up and if the woods are protected from fire and lumbering. The hammock association intergrades with the deciduous forests on more gradual slopes, especially where the soil is quite sandy.

of the famous Apalachicola River bluffs in Gadsden and Liberty counties, with their endemic *Torreya* and *Taxus* and such Appalachian species as *Cornus alternifolia*. A Florida endemic such as *Rhododendron minus* var. *chapmanii* also points to a time when the flora of the area was more like that of the southern highlands of the present day (see James, 1961). Apparently only steep and (often) north-facing terrain offered sufficient protection from the hot winds and intense insolation that favored the development of evergreen oaks and pines instead of deciduous woodlands. Only in these protected enclaves do the deciduous magnolias maintain their precarious Floridian existence.

In a few years clear-cut silviculture and residential sprawl may make fieldnotes on the adaptations of these plants to an alien environment unobtainable. The following observations on various species are offered for whatever ecological or taxonomic insights they may afford.

MAGNOLIA ASHEI Weatherby

The status of this, the rarest of American magnolias, has been open to dispute since its description by C. A. Weatherby in 1926. Weatherby differentiates it from *Magnolia macrophylla* by rather comparative traits: a little less hair on the undersides of the leaves, smaller flowers and leaves, the smaller size of the plants. Only its rather narrow infructescence, as opposed to the strikingly globular one of *M. macrophylla*, offers any certainty to the identification of herbarium specimens (Kurz & Godfrey, 1962). I am personally very familiar with both plants, yet am not at all sure I would be able to distinguish a vigorous leaf or large flower of *M. ashei* from one of ordinary *M. macrophylla*. Even the variations in the purple blotches at the center of the flowers — something rather difficult to observe in herbarium specimens — seem to run through identical ranges in the two plants.

The two plants are quite separable in the field, however. *Magnolia macrophylla* is essentially a tree; it competes for space in the canopy in much the same way a hickory or a

sweetgum will do, though these taller-growing trees may eventually overtop it. The young plants are therefore remarkably upright, and blossoming occurs only on mature shoots high above the ground. The collector who wishes to examine a *M. macrophylla* flower must locate either an isolated horticultural specimen or one released by clearing or roadbuilding. *Magnolia ashei* on the other hand behaves as a large, coarse shrub that seldom climbs out of the understory. It competes for light in the manner of the deciduous azaleas, by leaning toward holes in the canopy and by taking on a loose-jointed, often horizontal growth form. On rare occasions an individual specimen will become what might be termed a tree, but that plant will hardly ever exhibit the clean upward sweep of the average *M. macrophylla*. Though the plant's crowns sprout vigorously, individual shoots of *M. ashei*, from the evidence of all the dead wood, seem to be quite short-lived, and the species apparently is incapable in the wild of that sustained development on a single shoot necessary for competition in the upper layers of the forest. Horticultural specimens of *M. macrophylla* grow continuously from a single bole if undisturbed; *M. ashei* specimens can hardly be kept from coppicing.

Magnolia ashei seems to have adapted to its existence as a shrub by assuming a tolerance for shade and by blooming in the understory. The plant is remarkably free-flowering at small sizes; in the wild I have observed small shoots (ca. 1 meter) capped by a blossom while standing in the dense shade of *Quercus laurifolia*. In cultivation, the plant becomes strikingly floriferous. One in my care has set blooms on coppice shoots less than 10 cm. tall, and another has borne five blossoms on a single branched shoot not one meter tall or half a meter across. Such behavior in *M. macrophylla* is, to the best of my knowledge, unheard-of.

The present-day ranges of these two plants preclude genetic exchange. In Alabama I have never observed *Magnolia macrophylla* south of the rolling limestone hills stretching from northern Mobile County to Monroeville

and then eastward. In Mississippi and Louisiana the plant goes further south into areas underlain by more recent Tertiary formations, but along the Alabama-Florida border only a few north-south river valleys and bluffs interrupt the sterile Citronelle (late Pliocene or early Pleistocene) and later Pleistocene deposits blanketing the terrain. Neither taxon seems to have invaded the few upland hardwood areas in this region, possibly because both prefer rather more calcareous soils. I have never seen *M. ashei* north of the line traced by U. S. Highway 90.

The center of distribution of *Magnolia ashei* seems to be the Knox Hill region in eastern Walton County. In this strongly rolling area the sterile overburden is replaced by a dark, rich, water-retentive clay or loam derived from distinctly calcareous marl.[5] The plant is actually common on a few square miles surrounding Knox Hill. To the east it can be found on hills and along watercourses near Vernon, Washington County (geologically a rather similar area); on limestone hills along Econfina Creek in northern Bay County; on high slopes along the east bank of the Ochlockonee River near Smith Creek, Wakulla County; and on the Apalachicola bluffs between Bristol and Chattahoochee. The stations a few miles south of Chattahoochee bring *M. ashei* closest to *M. macrophylla*: patent *M. macrophylla* may be found in the ravines south of Ft. Gaines, Georgia, some 50 miles to the north. As best I can discover, the southern border of Clay County, Georgia, marks the southernmost extension of *M. macrophylla,* so intergradation seems highly unlikely.[6] It may be of interest that two other separable but closely related taxa, *Rhododendron minus* and its Florida form, *R. minus* var. *chapmanii,* reach their

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[5]The region contains rich collecting spots for Miocene shells of the Alum Bluff series. See Cook and Mosson (1929). Harper (1914) describes the soil and vegetation of this area.

[6]At least in Georgia. I am much less familiar with the southeastern corner of Alabama, so intermediates could conceivably be found in Henry or Houston counties. If they are there, however, they are elusive.

southernmost and northernmost stations within less than 10 miles of the comparable stations for *M. macrophylla* and *M. ashei*.

To the west of the Knox Hill region, *M. ashei* inhabits occasional very precipitous ravines and steepheads within Eglin Air Force Reservation. The westernmost station lies just off State Highway 87, about 20 miles east of Pensacola. It was from this region that W. W. Ashe obtained the series upon which Weatherby based his description of the species. Oddly enough, the soil on these slopes is sandy and apparently sterile, quite unlike the heavy soil of stations to the east. The deciduous element of the attendant vegetation is also attenuated, with *Fagus* notably absent, though *Ostrya, Oxydendrum,* and *Stewartia* are almost always present. *Gordonia lasianthus* is quite frequent along these streams.[7]

Magnolia ashei is thus probably a relict that through isolation has adapted to life as a shrub rather than a tree. The plant inhabits mixed evergreen and deciduous forests, and indeed the dense canopy offered by the evergreen magnolia and the evergreen oaks may have precluded competition in the manner open to *M. macrophylla* in regions where these evergreen hardwoods are not so common. Except in a few square miles the plant is remarkably rare; a comparably vulnerable, unusual, and attractive bird or mammal would surely have been the occasion for dozens of pilgrimages and popular articles.

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[7]The presence of *Magnolia ashei* in East Texas has been reported. Several years ago I observed a big-leafed magnolia in the yard of a gentleman living at "Devil's Pocket," a rather flat, swampy region in southern Newton County. He said this transplanted specimen was all that remained of an older plant that once stood in his pasture on a hammock. The plant has since died, so I have been unable to re-examine the specimen in the light of my field experience with Florida *M. ashei.* As I recall, the plant bore reduced leaves, but the form was definitely upright in a manner I later learned to associate only with *Magnolia macrophylla.* I saw no infructescences. Several years of searching and conferring have failed to turn up a single other plant in that county or in Texas. *Magnolia macrophylla,* it might be noted, is fairly common in adjacent western Louisiana.

MAGNOLIA ACUMINATA L.

Magnolia acuminata is a more decidedly Appalachian plant than *M. macrophylla*, yet it occurs in West Florida, perhaps in the form of *M. acuminata* var. *subcordata*. The distinction between the typical variety and var. *subcordata* seems more plausible to the reader of taxonomic keys than to the observer in the field, since great variations in hairiness and flower color may occur within a given locality (see Hardin, 1954). In general, the West Florida plants bear greenish-yellow flowers intermediate between the showy canary-yellow blooms of some plants in piedmont Georgia and the greenish forms prevalent in the higher mountains. Although the hairiest leaves I have ever seen on any cucumber-tree grew on a Florida specimen, closeby trees bore leaves indistinguishable from those on central Mississippi and northern Alabama plants. As with many other species, hairiness seems to increase gradually though irregularly southward, as water loss from the leaves becomes more and more of a threat to survival. I wonder if the cucumber-trees would be split at all if it were not for the historical accident that a singularly yellow form existed as a horticultural curiosity for almost a century until the piedmont Georgia plants were relocated by Berckmans in 1913 (Sargent, 1933).

In Florida *Magnolia acuminata* is to be found only in the Knox Hill region mentioned in the previous discussion. It is much less frequent there than *M. ashei*, however, growing only in a narrow band marking the transition between beech and hickory woods along a few ravines and slopes in the richest areas. There it becomes a fairly large tree. Kurz and Godfrey (1962) report that a search of the area located only six trees. Though I have located several hundred, distribution is sporadic and the trees are easily missed without a meticulous search in rather difficult country.

The Citronelle deposits mentioned earlier separate these Florida plants from the closest Alabama cucumber-trees,

a large population inhabiting the Sepulga River valley to its mouth in upper Escambia County, Alabama. The mouth of the Sepulga marks the southernmost outcropping of Oligocene limestone in that part of the state, so calcareous soil again seems to be the key to distribution. The limestone region in the Panhandle near Marianna and Tallahassee apparently does not support cucumber-trees, but then cucumber-trees are either exceedingly rare or entirely absent in immediately adjacent Alabama and southwestern Georgia. Southwestern Alabama and southern Mississippi, on the other hand, are replete with cucumber-trees. Possible reasons for this anomaly elude me.

Genetic isolation seems to have resulted in no genetic drift: trees from western Florida and southern Alabama occupy virtually identical sites and, from every appearance, are indistinguishable. *Magnolia acuminata* seems to be an intermediate in the plant succession — like sweetgum, say — whereas *M. ashei* is a more stable component of what seems to be a climax association. Its extremely rapid growth, handsome foliage, and tolerance for drought would make the coastal strain a fine shade tree for use in the lower South.

MAGNOLIA PYRAMIDATA Bartr.

This is the most common deciduous magnolia in West Florida. *Magnolia pyramidata* can be found in beech woods and on deciduous slopes throughout the area, both in the rich Knox Hill region and on the less fertile streambanks and bluffs along the Alabama line. Very steep north-facing slopes are its most typical habitat, where it can often be found amid mountain laurel thickets.

Magnolia pyramidata is the coastal equivalent of *M. fraseri* of the mountains. Whether these are separable either as species or as varieties is a moot question. Certainly if typical *M. acuminata* and *M. acuminata* var. *subcordata* are to be separated, these two plants should also be. On occasion, the mountain plant becomes a fair-sized tree with

a thick, low-branched bole; the Florida plant is much smaller, with an ascending form and (usually) a single trunk. I do not remember ever seeing a bole bigger than 10 cm. in diameter in West Florida. The leaves of the mountain plants tend to be much larger, also, though occasionally vigorous Florida specimens will belie the published keys. In East Texas (Jasper and Newton counties) putative *M. pyramidata* at times resembles *M. fraseri* in the size of leaves and the form and size of the trees, and is found, oddly enough, only on the top of a few sandy ridges; no one familiar with *M. pyramidata* in Florida could guess where to seek the Texas colonies. There is a gradual transition between *M. pyramidata* of Florida and *M. fraseri* of the mountains, since the Alabama and Georgia plants form a continuous sequence from north to south in these states.

In Florida this plant is occasional and hardly ever produces what might be termed colonies. The plant is by no means uncommon, however, and a belief that it is reflects not the state of nature but our limited knowledge of the complexities of coastal vegetation. Like *Stewartia malacodendron,* which is often termed rare in handbooks, *M. pyramidata* seems quite frequent once its habitat is understood and sought out.

MAGNOLIA TRIPETALA L.

This is apparently the first record of the occurrence of this magnolia in Florida. So far I have found it only along about half a mile of high north-facing bluff and in a contiguous ravine system on the Shoal River, approximately two miles west of Dorcas, Okaloosa County. This particular section is steep, but no more so than several other bluffs and ravines along the Shoal and nearby Yellow rivers. The bluffs are composed of Miocene marl, and the segment bearing *M. tripetala* does seem to be covered by an unusual quantity of redbud (*Cercis canadensis*), which in Florida is a good indicator of limy soil. The ravine system itself, where perhaps 95% of the *M. tripetala* plants grow, is

a delightfully unspoiled area, with two small springfed streamlets running over large blocks of marl, uncut hardwoods such as beech and white oak and linden, an interesting herbaceous layer, and here and there the big leaves of the magnolias. This surprising and isolated stand of this species is so small it could easily be destroyed entirely by clearing or even lumbering.

The closest extensive colony of *Magnolia tripetala* on the Coastal Plain seems to be located on the north-facing bluffs along Hog Creek, Randolph County, Georgia. There *M. tripetala* is a vigorous competitor in the subcanopy, resembling in form and habit the specimens of *M. macrophylla* with which it grows; in competition with *M. macrophylla* it seems to favor the very steepest bluffs and the deepest and darkest ravines. The Florida plants, on the other hand, grow in a better-lighted area and mix with an understory of *Stewartia* and small dogwood and redbud trees — the last of which is certainly not a remarkably tolerant species. I have observed no stem more than 6 or 8 cm. in diameter, nor is any plant more than 10 meters tall. The great majority are between 3 and 5 meters.

Though an analogy to the reduced stature of *Magnolia ashei* suggests itself, it seems likely that reduced vigor rather than genetic divergence accounts for the difference between ordinary *M. tripetala* and the Florida plants. For one thing, there are dead stems leading from a high percentage of the crowns, so perhaps the leaders cannot survive long enough to grow into a well-developed tree. The form of the plant is upright, unlike the horizontal tendency of the truly shrubby *M. ashei*. Most significantly, they show none of the ability of *M. ashei* to bloom vigorously at a small size, and that would surely be a necessary concomitant to a genuine adaptation to existence as a shrub. In fact, no *M. tripetala* seedlings could be discovered in a rather meticulous search; only sprouts upon older rootstocks were discovered. The plants do show one singular habit, however. Approximately half the clumps are attended (at a distance of a meter or so) by one or more small satel-

lite plants which can be traced by what appear to be horizontal runners back to the central crown. I have never observed this tendency to spread by vegetative means in other magnolias, and a check of the Hog Creek colony has revealed only a few sprouts which might be thought comparable. At the present time I am cultivating several of the Florida offsets in hopes of comparing their behavior with a seedling *M. tripetala* taken from a vigorous colony found in coastal North Carolina near New Bern.

Other stations close to the Shoal River colony seem to be (1) on the Pascagoula River in southern Mississippi and (2) in Butler County, Alabama (W. H. Duncan, personal communication). Since I have, unfortunately, never located either station, I cannot comment on the vigor or habitat at other locations on the southern coastal plain.

This deciduous magnolia seems to be the ultimate example of an Arcto-Tertiary relict which has persisted in an island of mesophytic forest on a protected north-facing slope amid the pinewoods of Florida. How long this colony has been there or whether it is the remnant of a larger colony would be impossible to say. For some time now it may even have been regenerating itself almost entirely by vegetative means. Its chances of surviving the chain saw and the log sledder and the bulldozer seem easier to estimate. It does seem unfortunate, though, that all that will remain of such a dogged adaptation to an alien environment will be a few dried sheets in a herbarium and an aberrant dot on a map.[8]

[8]Specimens of the plants discussed in this article have been deposited in the herbarium of the University of Georgia. In particular, I would like to express my appreciation to its director, Professor Wilbur H. Duncan, for his unfailing generosity with his expertise and for his remarkable tolerance for amateur enthusiasm.

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